

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)	
)	
Review of Part 15 and Other Parts of the)	ET Docket 01-278
Commission's Rules)	
)	

**COMMENTS OF FRED C. JENSEN
AMATEUR RADIO LICENSEE K6DGW**

I submit the following comments in response to the Commission's request in paragraph 27 of the subject docket, as contained in electronic file FCC-01-290A1, and in opposition to the SAVI Technologies petition for rule making regarding radio frequency identification devices (originally contained in RM-10051), and summarized in paragraphs 25 - 27 of the subject docket.

Background: I have been continuously licensed as an amateur radio operator since 1953, and have held an Amateur Extra Class license since 1956. Except for a period from mid 1964 through the end of 1967 when, as an officer in the US Air Force, I was stationed in Vietnam and surrounding countries, I have been continuously active. I am currently active on the 420-450 amateur band, both for amateur satellite work, and as a member of the Sierra Radio Association and Cactus Intertie, Inc., a system of 150+ linked amateur remote and repeater stations stretching from northern California across the southwest to eastern Texas.

Knowledge of SAVI Technologies RFID Equipment: In the mid-90's, while employed by Science Applications International Corporation (SAIC) as Chief Engineer of one of their divisions, I was assigned to work with SAVI Technologies and their equipment in support of a proposal they were making to the US Department of Defense. During this assignment, I had occasion to work with and on their equipment, to observe its performance, and to gain intimate familiarity with its various applications.

Comments on Docket 01-278:

- 1) **Areas of RFID Operation:** Paragraph 26 of the subject docket states that, *"SAVI, in its reply comments, argues that their RFID systems typically operate in commercial areas where there are few amateur operations ..."* SAVI's reply comments are patently and demonstrably untrue. In my reply comments to RM-10051, I provided an example at the Port of Oakland (CA), a "yard" application of the SAVI system in close proximity to multiple, high sensitivity receivers with line-of-sight visibility to the port facilities. Another such example is the Intermodal Terminal at the Union Pacific rail yards in Roseville, CA. This facility is closely surrounded by dense residential areas where there are many amateurs. A similar terminal exists in the Reno-Sparks, NV area, again closely surrounded by residential areas, many on hillsides with line-of-sight visibility, and this situation is true in innumerable other cities and populated areas. 433.92 MHz is in the middle of a portion of the 70cm amateur band designated for auxiliary and link circuits in the cooperative ARRL band plan, circuits using receivers with noise floors in the -150 to -165 dBm range. The only reason the SAVI (and like) equipment does not create intolerable interference now is RFID has been somewhat slow to catch on commercially (major investment vs problematical gains), and that its permissible field strengths and transmission durations are limited by the Commission's existing Part 15 rules.
- 2) **Type of Modulation:** The assertion that *"...the type of modulation used by SAVI is unlikely to interfere with ... amateurs,"* is also patently untrue. The SAVI equipment radiates a (pseudo) narrow band signal on a nominal frequency of 433.92 MHz with modulation that is clearly audible on communications receivers, and which desensitizes them when tuned to or near that frequency. (I term the signals "pseudo-narrow band" because the interrogator and tag devices must be manufactured at the lowest unit costs possible to keep overall system costs in an acceptable range. This precludes high stability oscillators. They are nearly

always mounted outside, subject to the extremes of temperature, and their actual frequencies vary with device and over time. Each device is narrow-band, however a normal installation in a warehouse yard would find devices transmitting at various frequencies, generally centered around 433.92 MHz, and would consume a much greater bandwidth than a controlled test in a laboratory would discern.)

- 3) **Proposal to Increase Permissible Average Field Strength to 11,000 uv/m @ 3m:** Currently, the rules under which the SAVI devices are operated (15.231(e)) provides for a maximum average field strength of approximately 4,400 uv/m @ 3m at 433.92 MHz. The proposed maximum average value of 11,000 uv/m @ 3m represents an increase of 2.5 times. While the proposed new maximums are the same as those imposed on equipment operating under the provisions of 15.231(a), it is important to note that 15.231(a) permits the transmission of control signals only, and specifically excludes the transmission of data (i.e. long duration transmissions).
- 4) **Proposal to Increase Permissible Transmission Durations:** There are two issues: a) The proposed increase in permissible duty cycle of periodic transmissions; and b) The coupling of those proposed duty cycle increases with the increased field strengths permitted under 15.231(a).
 - a) Currently, 15.231(e) limits periodic transmission duration to a maximum of 1 second, followed by a quiet period of at least 30 times that of the transmission, but no less than 10 seconds, a worst case duty cycle of 0.0323. Ignoring for a moment the question of retransmissions, the proposal contained in the docket (120 seconds followed by a quiet period of no less than 10 seconds) results in a worst-case duty cycle of 13.000, 433 times that now permitted. The docket proposal effectively allows almost continuous transmission.
 - b) Currently, 15.231(a) allows a higher field strength, but restricts devices to non-periodic control transmissions, except that 15.231(a)(3) allows periodic transmissions for *"...polling and supervision to determine system integrity of transmitters used in security or safety applications ..."* The maximum permissible duty cycle is 0.0003 (one, 1s transmission per hour). The docket's proposed permissible duty cycle is 46,800 times this value! While SAVI's filings will suggest that their system will only interrogate each tag infrequently, the typical application will be interrogating many tags in a yard or storage area. Giving SAVI (and any other such) devices the prerogative of essentially continuous transmission at field strengths permitted only for duty cycles of 1 second in 3,600 seconds can only be seen as a gross perversion of the Commission's long standing approach to unlicensed intentional radiators.
- 5) **Retransmission in the Event of Data Errors:** SAVI bases its need for the proposed changes on its need to transmit up to 128 Kbytes of data from the tag in 2 minutes. Assuming no overhead (the ideal and unattainable case), transmitting 128 KB of data equates to just over 1 megabits, and demands a channel bit error rate of better than 1×10^6 to even possibly complete a full transmission. Given the non-optimal circuit between the tag and the interrogator, this is extremely unlikely, and retransmissions will be a near certainty. Further, in the case of an intermodal terminal such as at Roseville, CA, the arrival of a container train (100 cars x 2 containers per car) would likely necessitate interrogating the contents of all 200 containers ... at 2 minutes per container, something over 6.6 hours of continuous transmission, assuming perfect scheduling, no retransmissions, and no collisions. Thus, exempting retransmissions from the duty cycle limitation simply assures that the devices will be transmitting continuously.

Other Factors and Considerations:

- 1) **Relative Impact of Field Strength vs Permissible Transmission Duration:** Increasing the maximum permissible duty cycle 433 times, from the current limitations of 15.231(e) to that proposed in the docket, is by far the largest threat to harmful interference from SAVI devices. Increasing the maximum permissible field strength certainly increases the probability that the devices will be heard by weak signal receivers in licensed services, however the interference caused will still be very significantly mitigated by the short duration of the transmissions. Essentially, a weak signal receiver may be interfered with by a short duration burst, however the very much longer quiet period following it will permit communications.
- 2) **Risks to Mitigation Following Deployment:** The proposals contained in the subject docket, if implemented, are effectively irrevocable. Once capital investments have been made to deploy the new, higher powered/longer duration equipment, the Commission will find it very difficult if not impossible to reverse or modify its actions should the predictions regarding harmful interference materialize. I submit

that a decision to allow unlicensed operation under new relaxed rules in such an irrevocable environment is unwise.

Conclusion: Far from "serving the [general] public interest," the changes proposed in the docket serve only a business interest, and a very narrow one at that. At the same time, they pose significant threats of harmful interference to licensed services, threats that have either not been addressed, or simply dismissed by supporters of the proposed changes. I believe the facts and evidence overwhelmingly demand that the changes to Part 15 proposed in the docket as a result of the original SAVI petition be denied. The choice of 433.92 MHz was theirs (other RFID vendors have chosen other, more appropriate frequencies), and there are a number of alternatives for SAVI to achieve its goals without obtaining massive changes to a set of rules that have worked well for a long time.

Sincerely,

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